

## CLAIMS

1. A method of fabricating an SOI wafer comprising:
  - an insulating film formation step forming an insulating film on a
  - 5 first main surface of at least either one of a first substrate, and a second substrate composed of silicon single crystal;
  - a separatory ion implanted layer formation step forming a separatory ion implanted layer by implanting ions from the ion implantation surface on the first main surface side of the second
  - 10 substrate;
  - a bonding step bonding the second substrate having the separatory ion implanted layer formed therein and the first substrate while opposing the first main surfaces with each other, placing the insulating film in between;
  - 15 a separation step succeeding the bonding step, separating a bonded silicon single crystal film, later becoming an SOI layer, from the second substrate at the position of separatory ion implanted layer; and
  - a planarization step planarizing the separation surface side of the bonded silicon single crystal film so as to produce the SOI layer,
  - 20 wherein, in the separatory ion implanted layer formation step, depth of formation of the separatory ion implanted layer measured from the ion implantation surface is adjusted through a magnitude of the ion implantation energy in order to adjust thickness of the bonded silicon single crystal film depending on thickness of the SOI layer to be
  - 25 obtained, and dose of the ion implantation is set smaller as the depth of

formation of the separatory ion implanted layer measured from the ion implantation surface becomes smaller.

2. The method of fabricating an SOI wafer as claimed in Claim  
5 1, wherein the planarization step further comprises a polishing step  
polishing the separation surface side of the bonded silicon single crystal  
film.

3. The method of fabricating an SOI wafer as claimed in Claim  
10 2, wherein, in the polishing step, polishing stock removal of the  
separation surface side of the bonded silicon single crystal film is set  
smaller as surface roughness of the separation surface of the bonded  
silicon single crystal film becomes smaller.

15 4. The method of fabricating an SOI wafer as claimed in Claim  
3, wherein the dose of the ion implantation is set smaller, and the  
polishing stock removal, in the polishing step, of the separation surface  
side of the bonded silicon single crystal film is set smaller, as the  
thickness of the SOI layer to be obtained becomes smaller.

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5. The method of fabricating an SOI wafer as claimed in any  
one of Claims 1 to 4, wherein the insulating film is a silicon oxide film.